

## ***Interactive comment on “Stochastic rainfall analysis for storm tank performance evaluation” by I. Andrés-Doménech et al.***

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### GENERAL REMARKS

This manuscript provides an analysis of a stochastic rainfall model combined with a curve-number based rainfall-runoff model for the design and performance of urban storm detention tanks, with applications for the cities of Valencia and Santander (Spain). This research topic is certainly of interest to the readers of Hydrology & Earth System Sciences.

However, although I have not found any major flaw in the analytical development presented by the authors, the manuscript does not provide a very compelling case for simplified stochastic models allowing analytical treatment and why they would be prefer-

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able over more elaborate (but perhaps more realistic) numerical modeling approaches. This is mainly related to the necessarily simplified models employed by the authors to describe the stochastic properties of the rainfall process and the resulting rainfall-runoff transformation. How realistic are the assumptions on which these models are based, given the spatio-temporal complexity of precipitation and its resulting hydrological response in the urban areas considered?

As far as I am concerned, these issues should be discussed in greater detail, should the authors wish to submit a revised version of their manuscript. Below, I provide some additional technical remarks that merit further attention, plus a relatively long list of editorial remarks.

### SPECIFIC REMARKS

- P.1855, l.21-22: “... the coefficient of variation (CV) of a Poisson process should be equal to unity”. Actually, the CV of the interevent time of a Poisson process should be equal to unity.

- P.1855, l.22-23: “In fact, ...  $CV = 1$ ”. Please remove this entire sentence: it repeats the message of the previous sentence and, in addition, the parameter beta has not yet been defined.

- P.1859, Eq.(9): Supposedly, this equation provides the “runoff volume generated by the rainfall event”. However, isn't it true that an important assumption implicitly incorporated in this expression is that rainfall over the (urban) areas to which the presented model is applied can be considered to be spatially uniform? Is this assumption warranted in the considered cities? Please comment on this issue, both in the reply to the review reports and in the revised version of the paper.

- P.1862, l.7-14: The process by which the value of  $s_{crit}$  is estimated seems rather subjective. How plausible (i.e. realistic) is the identified rainfall process? It seems the value of  $s_{crit}$  is estimated so as to force Eq.(2) to fit the available data as closely as

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possible. However, what does the identified value of  $s_{crit}$  mean in physical terms? Related to this issue, wouldn't it have been more reasonable, given the rainfall climatologies of the considered urban areas, to employ a more sophisticated stochastic rainfall process, including clustering of rain cells, e.g. as represented by means of a Neyman-Scott or a Bartlett-Lewis process?

- P.1862, l.22: The value of 0.667 is called "significant correlation" in the previous sentence. Do the authors mean "significant" as in "statistically significant" (if yes, please provide results of a statistical significance test) or do they rather mean "appreciable" (in that case, I do not fully agree with authors, as a correlation coefficient of 0.667 implies an explained variance of 0.667<sup>2</sup>, which is less than 50%)?

- P.1863, l.3: "... the exponential model is quite unlikely in all cases". Does a different choice for the pdfs of event rainfall depth and duration affect the analytical results presented in Section 3?

- P.1864, l.11-17: The presented analytical model is employed to estimate the expected values of runoff and overflow volume. However, what does the model learn us about the related variances (i.e. the fluctuations about the mean values), which seem to be highly relevant from a practical perspective as well?

- P.1864, l.18: "In order to validate the results ...". The data which are employed by the authors to perform this validation, are they different from the data that have been used to identify the probabilistic model parameters?

#### EDITORIAL REMARKS

- P.1850, l.9: Insert comma between "applied" and "where".

- P.1850, l.10: Replace "In the model herein used" with "In the presented model".

- P.1850, l.16: Insert comma between "Santander" and "located".

- P.1850, l.18: Insert "a" between "provided" and "better fit".

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- P.1850, l.26: Insert "the" between "keep" and "overflow".

- P.1851, l.16: Replace "Then, some" with "Later, some".

- P.1851, l.22: Replace "In the model herein used" with "In the presented model".

- P.1851, l.29: Insert "the" between "why" and "exponential probability distribution".

- P.1852, l.1: Insert comma between "simplicity" and "which"; insert comma between "other hand" and "it has limited".

- P.1852, l.12: Replace "Then, results" with "Subsequently, results".

- P.1852, l.19: Insert "the" between "the long term ratio of" and "number of events".

- P.1852, l.20: Replace "Accuracy of the results" with "The accuracy of the results".

- P.1853, l.6: Replace "with a very unequal distribution trough the year" with "with a very strong seasonality".

- P.1853, l.19: Replace "in nearby raingauge stations" with "at nearby raingauge stations".

- P.1854, l.2: Replace "to size detention tanks" with "to design detention tanks".

- P.1854, l.4: Replace "sewer of the city" with "sewers of the city"; insert comma between "city" and "which".

- P.1854, l.6: Insert comma between "13.4 km" and "with 565 manholes".

- P.1854, l.11: Insert comma between "2004)" and "which"; replace "consider" with "considers"; replace "land uses" with "land use types".

- P.1854, l.13: Replace "land use" with "land use type".

- P.1854, l.17: Insert comma between "(mm)" and "which".

- P.1856, l.7: Insert "the" before "Hazen plotting position".

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- P.1856, l.9: Replace “Then, we estimated” with “Subsequently, we estimated”.
- P.1856, l.11: Replace “Goodness of fit” by “The goodness of fit”.
- P.1856, l.12: Insert “the” between “of” and “empirical”; insert “the” between “versus” and “theoretical”.
- P.1856, l.25: Insert “the” between “of” and “number”.
- P.1857, l.1: Replace “Dependence structure” with “The dependence structure”.
- P.1857, l.2: Replace “lag” with “lags”.
- P.1857, l.4: Insert “the” between “at” and “96% confidence level”.
- P.1857, l.5: Insert “the” between “to” and “stochastic processes”.
- P.1857, l.7: Insert comma between “distribution” and “which”.
- P.1857, l.11: Insert comma between “hydrological variables” and “which implies”.
- P.1857, l.14: Replace “Cumulative probability function” with “The cumulative probability function”.
- P.1858, l.2: Replace “Accordingly to” with “According to”.
- P.1858, l.13: Insert “the” between “Thus, “ and “probability density function”.
- P.1858, l.18: Insert “the” between “Thus, “ and “runoff volume”.
- P.1859, l.15: Insert “the” between “to” and “waste water treatment plant”.
- P.1860, l.12: Replace “accordingly to” with “according to”.
- P.1860, l.19: Replace “could be written as” with “can be written as”.
- P.1861, l.3: Insert “the” between “Therefore, “ and “expected value”; insert “the” between “of” and “spilled volume”.

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- P.1861, l.8: Replace “Volumetric efficiency” with “The volumetric efficiency”.
- P.1861, l.10: Insert “the” between “Finally, “ and “overflow reduction efficiency”.
- P.1861, l.13: Replace “to not produce” with “not to produce”; replace “depending on” with “as a function of”.
- P.1862, l.3: Replace “the series resolution” with “the temporal resolution”.
- P.1862, l.5: Insert “the” between “for” and “beta parameter”.
- P.1862, l.6: Replace “Results are summarized” with “The results are summarized”.
- P.1862, l.15: Replace “Selection” with “The selection”.
- P.1862, l.16: Insert “the” between “that” and “autocorrelation coefficients”.
- P.1863, l.9: Insert “the” between “with” and “maximum likelihood procedure”.
- P.1863, l.12: Insert “the” between “In all cases” and “goodness of fit”; insert “the” between “for” and “censored series”.
- P.1863, l.14: Insert “the” between “while” and “Gamma-2 model”.
- P.1863, l.17-18: Replace “experienced” with “employed”.
- P.1863, l.23: Insert “the” between “for” and “Valencia case study”.
- P.1863, l.24: Replace “Fit provided” with “The fit provided”.
- P.1864, l.2: Replace “Critical interevent time” with “The critical interevent time”.
- P.1864, l.3: Replace “half at Santander than at Valencia” with “half at Santander compared to that at Valencia”; insert “a” between “for” and “maritime”.
- P.1864, l.4: Insert “the” between “in” and “event duration pdf”.
- P.1864, l.6: Insert “the” between “model)” and “Pareto model”.

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- P.1864, l.7: Replace “for rainfall regime” with “regarding the rainfall regime”.
- P.1864, l.8: Replace “a flexible approach for identify” with “a flexible approach to identify”.
- P.1864, l.18: Insert “the” between “validate” and “results”; insert “a” between “method, “ and “continuous simulation”.
- P.1864, l.19: Insert “the” between “using” and “observed”; replace “17 years rainfall record” by “17-year rainfall record”; insert comma between “record” and “which”.
- P.1864, l.21: Insert “the” between “of” and “sewer network”.
- P.1865, l.4-5: Insert “the” between “evaluate” and “overflow reduction efficiency”.
- P.1865, l.9: Replace “summarises” with “summarizes”.
- P.1865, l.10: Insert “the” between “both” and “probabilistic”; insert “the” between “and” and “continuous approaches”.
- P.1865, l.14: Insert “the” between “for” and “development”.
- P.1865, l.15: Replace “tank sizing procedures” with “tank design procedures”; insert “a” between “such” and modelling solution”.
- P.1865, l.17: Replace “accordingly to” with “according to”.
- P.1866, l.3: Insert comma between “Santander” and “respectively”.
- P.1867, l.12: Replace “Hydrolog.” with “Hydrol.”.
- P.1868, Table 1: Perhaps several smaller tables can be combined into one larger table?
- P.1869, caption Table 2: Insert “the” between “for” and “Valencia raingauge”.
- P.1871, caption Table 4: Replace “can not” with “cannot”.

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- P.1872, caption Table 5: Insert “the” between “for” and “Santander raingauge”.
- P.1876, Fig.3: Please explain the symbols employed in this figure in the corresponding figure caption.
- P.1877, caption Fig.4: Replace “parameters” with “parameter”.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 1849, 2010.

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